

What is claimed is:

1. A gas particle partitioner, comprising:
a particle charger for producing charged particles in an aerosol with no appreciable change to chemical composition of a gas phase of the aerosol;
a fractionator for operating on said charged particles to fractionate said aerosol into a particle laden gas stream and a particle free gas stream;
and
a flow splitter for separating said particle free gas stream from said particle laden gas stream.
2. The gas particle partitioner of claim 1, wherein the particle charger is selectively activatable, and the charged particles produced by said particle charger are unipolar charged.
3. The gas particle partitioner of claim 2, wherein said particle charger comprises a corona discharger and a permeable electrode; and
wherein ions from said corona discharger are transported through said permeable electrode to interact with and electrically charge particles in said aerosol, whereby said charged particles are produced.
4. The gas particle partitioner of claim 3, wherein said permeable electrode separates a corona discharge area on one side of said electrode from an aerosol charging zone on another side of said electrode, and further comprising means for washing said corona discharge area with a particle free fluid to minimize any transport of gas components produced by corona discharge from said corona discharger to the aerosol.

5. The gas particle partitioner of claim 4, wherein said particle free fluid comprises an air flow, and further comprising means for regulating said air flow and flow of said aerosol to isokinetic conditions to disallow gas exchange between said air flow and said aerosol.

6. The gas particle partitioner of claim 5, wherein said permeable electrode comprises a permeable grid electrode, and said ions are transported through openings in said permeable grid electrode due to said electric field.

7. The gas particle partitioner of claim 6, wherein said corona discharger comprises a corona discharge wire switchably connectable to a corona voltage source.

8. The gas particle partitioner of claim 7, wherein said corona discharge wire comprises electrically conducting material.

9. The gas particle partitioner of claim 7, wherein said permeable grid electrode surrounds said corona discharge wire, said corona discharge area is interior of said electrode, and said aerosol charging zone is outside of said electrode.

10. The gas particle partitioner of claim 9, wherein a voltage is applied from a voltage supply to said permeable grid electrode to produce an electric field, and said ions are transported through openings in said electrode due to said electric field.

11. The gas particle partitioner of claim 4, further comprising first means for measuring ionic current produced by said corona discharge, and second means, responsive to said first means, for controlling ion production by said corona discharger.

12. The gas particle partitioner of claim 11, wherein said first means includes a shielded connector.

13. The gas particle partitioner of claim 1, further comprising an aerosol inlet for producing a laminar flow of the aerosol to said particle charger.

14. The gas particle partitioner of claim 1, wherein said fractionator comprises a first electrode, a second electrode spaced from said first electrode, and means for selectively applying an electric field between said first and second electrodes, whereby when said aerosol flows between said first and second electrodes, the charged particles in said aerosol are deflected by said applied electric field towards said second electrode.

15. The gas particle partitioner of claim 14, wherein said fractionator produces a particle free gas stream adjacent said first electrode and a particle laden gas stream adjacent said second electrode when said electric field is applied.

16. The gas particle partitioner of claim 15, wherein said first electrode comprises an inner cylindrical wall and said second electrode comprises an outer cylindrical wall.

17. The gas particle partitioner of claim 16, wherein said flow splitter comprises a conductive ring located near an outlet of the fractionator, and means for applying a voltage to said ring.

18. The gas particle partitioner of claim 14, wherein said means for selectively applying an electric field comprises a voltage supply switchably connectable to at least one of said first and second electrodes, and a shunt resistor for minimizing switching dead time.

19. The gas particle partitioner of claim 7 wherein said conducting material comprises silver.

20. Apparatus for removing particles from an aerosol, comprising:
a particle charger for imparting a charge to particles in an aerosol without affecting thermodynamic characteristics or chemical composition of a gas phase of the aerosol;
means for deflecting charged particles in the aerosol to provide a portion which is particle free but otherwise substantially identical to said aerosol; and
means for physically separating said portion from the aerosol.

21. The apparatus of claim 20 wherein said particle charger includes means for aerodynamically substantially preventing any gas components produced by said particle charger from reaching said aerosol, except for ions to charge the particles.

22. A method for removing particles from an aerosol, comprising:
imparting a charge to particles in the aerosol;
preventing alteration of chemical composition of a gas phase of the aerosol;
deflecting charged particles in the aerosol to produce a particle free portion; and
separating said particle free portion from the aerosol.